(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 785 709 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
16.05.2001 Bulletin 2001/20

(51) Int Cl.[7]: **H05K 13/00**

(21) Application number: **97100376.9**

(22) Date of filing: **10.01.1997**

(54) **Continuous carrier for electrical or mechanical components**

Endlos-Trägerband für elektrische oder mechanische Bauelemente

Transporteur sans fin pour composants électriques ou mécaniques

(84) Designated Contracting States:
DE FR GB IT

(30) Priority: **11.01.1996 US 584534**

(43) Date of publication of application:
23.07.1997 Bulletin 1997/30

(73) Proprietor: **Autosplice Systems, Inc.**
San Diego, California 92121 (US)

(72) Inventors:
- **Bianca, Giuseppe**
  Temecula, CA 92592 (US)
- **Bogursky, Robert M.**
  Encintas, CA 92024 (US)

(74) Representative: **Füchsle, Klaus, Dipl.-Ing. et al**
Hoffmann Eitle,
Patent- und Rechtsanwälte,
Arabellastrasse 4
81925 München (DE)

(56) References cited:
EP-A- 0 333 395
US-A- 5 263 241
US-A- 5 377 403

EP 0 785 709 B1

Description

[0001] The invention is directed to a continuous carrier support for carrying electrical or mechanical components for automatic placement on a printed circuit board (PCB) or the like.

BACKGROUND OF INVENTION

[0002] Tape and reel supply of electrical parts for automatic pick-and-place by a mechanical or pneumatic device onto a PCB or similar device is well known in the art. See, for example, the description in copending US application, Ser. No. 08/084,579. In the conventional system, a plastic carrier tape with sprocket holes along one or both edges is embossed to form a series of pockets into each of which is placed a separately made electrical component. The assembly is then covered with a plastic strip and reeled up on a reel. During assembly of the PCB, the carrier tape is unreeled, the plastic strip removed, and a pick-and-place head is used to contact and pick a surface mount technology (SMT) component out of a carrier pocket and place it in a desired position, usually under control of a computer, on one or more tinned PCB pads. The latter are usually provided with solder paste that acts as a temporary adhesive to hold the SMT part onto the PCB pads during a subsequent solder reflow process which permanently bonds and electrically connects the part to the PCB circuitry via the pads. This system has been successfully used for many years. However, there is a continuous trend toward reducing equipment costs and in particular assembly costs. The conventional embossed carrier tape-assembly process is expensive, and has the further disadvantage that it is not well suited for a mechanical pick-and-place device which has to penetrate into the cavity of the pocket in order to grip the component.

[0003] Commonly-owned US patent 4,832,622 describes the manufacture of a continuous strip of header components by continuous extrusion or by semi-continous injection molding. In both cases, the entire header body of each component is molded of the same plastic material simultaneously with the plastic material that couples the header bodies together. In the case of the semi-continuous molding, the coupling for the header bodies is a spine member that is molded simultaneously with the header bodies and therefore must be of the same material. This scheme which works well suffers from the disadvantage of limited ability to adjust to different conditions. In particular, the scheme described in this patent is not doable for component coupling means that is preformed or constituted of a different material than that of the component body. Moreover, the link between the components and the component coupling means is typically relatively strong, which requires a special cutter to separate each component from its coupling means. Finally, the resultant product, as described, is not suitable for processing by pick-and-place devices using a suction head.

[0004] A further prior art that is of interest is US-A-5 263 241 that is concerned with an elongated strip of steel in the form of a frame for temporarily carrying a plurality of pressure sensitive housings. The elongated strip is defined by two parallel spaced-apart side edges interconnected by a plurality of spaced-apart cross-members that are at right angles to said side edges. The space between each adjacent pair of cross-members is referred to as being a cell. Into each cell project four tabs in the plane of said frame, each tab being part of the frame. The four tabs extend towards each other to define an X-formation but with their free ends or tips spaced well apart from each other. Each pressure sensitive housing is created by molding it into its respective cell such that the tips of the four tabs of that cell project slightly into the walls of the molded housing to form small indentations therein. Thus the tips of the four tabs hold the molded pressure sensitive housing in position in its cell. The tabs are deformable to subsequently permit a pressure sensitive housing to be pushed out of its cell. The loaded frame can be stacked.

[0005] The carrier frame of this prior art is initially formed in a continuous strip but is then cut into desired lengths according to the number of cells that are to be present in each cut length. The cuts are made through the aforesaid cross-members so that the end cross-members of each cut-off length are narrower and weaker than the intermediate cross-members.

[0006] A disadvantage of this prior art is thus that the number of cells per length is limited in view of the intended stacking of said lengths; and that the resulting lengths cannot, for example, be reeled up to form a long continuous flexible strip suitable for use with reel-based automatic insertion equipment. Further the small penetration of the tips of the aforesaid tabs of each cell into the walls of the molded housing in each cell may on uneven cooling of the molded pressure sensitive housing cause their rejection to relieve stress. Additionally, since the end cross-members of each said cut-off length are narrower and weaker than the intermediate cross-members, the molded housing in each end cell of a cut-off strip is not held with the same firmness as are the molded housings in the intermediate cells of a cut-off length.

SUMMARY OF THE INVENTION

[0007] The present invention is as defined in the accompanying claims.

[0008] The principal object of the invention is a new continuous carrier for electrical or mechanical parts that is less expensive, sufficiently adjustable to accommodate electrical or mechanical components of any shape, size, or configuration, and will work satisfactorily with either or both mechanical and pneumatic types of pick-and-place devices.

[0009] Another object of the invention is a new method of fabricating a continuous carrier supporting certain

types of electrical parts or mechanical parts, and in particular SMT components.

[0010] These and other objects are achieved in accordance with one feature of the invention by molding at least one continuous flexible film strip or filament to a side of each of a series of desired electrical or mechanical components such that the components are supported by the film strip or filament. The molded connection between each of the components and its supporting strip or filament is such that the components are readily separated from its supporting strip or filament in any one of several ways, such as by pushing, pulling or cutting, without damage to it or its neighboring components.

[0011] A preferred embodiment of the invention comprises molding opposite sides of a series of desired components to continuous flexible film strips such that the components are suspended between the film strips. The film strips may be provided with sprocket holes or other equivalent structure for advancing the film strips during the molding process and for reeling up the resultant assembly onto a reel for sale or distribution to a PCB assembler. The latter places the reel of molded parts onto a conventional feeding device which can use the same sprocket holes or other equivalent structure for feeding the resultant carrier to, for example, an automatic pick-and-place machine. The parts are then separated from the supporting strips, picked up by a conventional pick-and-place device in the machine and placed onto the PCB in the normal manner.

[0012] In this process according to the invention, no embossing step of a plastic carrier is required, no cover strip is needed to keep the parts from falling out of their respective pockets, and no assembly of components into the pockets is needed. The result is that the cost of fabricating packaged parts on a continuous carrier tape for automatic placement on PCBs is greatly reduced. In addition, the supporting strip or filament can be constituted of any material that can be attached to the moldable region of the component while the latter is molded. Another advantage achieved with the invention is that the component parts supported by the carrier strip or filament can be made readily accessible both to the normal suction head of a pneumatic pick-and-place device, as well as the normal gripper of a mechanical pick-and-place device. Still another advantage is that more parts per linear foot of the carrier is possible as the components can be more closely spaced.

[0013] A further advantage of the embodiment employing spaced strips on both sides is that any difference in shrinkage between the component molding and the carrier strips is not reflected in any loss in accuracy of any locator means on the strip, such as, for example, drive holes.

[0014] The invention is especially useful for the fabrication of component parts that include, as a major constituent, a molded plastic body. Preferably, the film strips or filaments are constituted of a material that is capable of withstanding the elevated temperatures required to injection mold the plastic body of the components. The molded connection of the strips or filament to the plastic component body is achieved, in accordance with another aspect of the invention, by feeding the plastic strips or filament into the injection mold so as to overlie, at least at one side, each mold section, clamping the strip or filament in that position, and then injecting molten plastic to form the molded body and attach or encapsulate the overlying strip or filament edge. The amount of overlap controls the pull-off strength of the components from the strip or filament. Preferably, the overlap is chosen to provide a pull-off force of between about 3-5 pounds per side strip.

[0015] The invention is applicable not only to injection molded insulating plastic materials, but also to other similarly formable materials and processes. Typical insulating plastics such as ABS, PPA, polyesters, and polycarbonates can be used to make insulating parts, as well as silicone rubber materials. In adition, the parts can be made electrically-conductive by using electrically conductive plastics or by compounding insulating material with stainless steel fibers, carbon fibers or carbon powder. The formable material can also include fibers for reinforcement, such as glass fibers. In addition, the invention is also applicable to the molding of metals, typically low-melting-point metals such as zinc. The process of injection molding of zinc is called die casting, but the process is very similar to the injection molding of plastics in that the zinc is melted and as a fluid is injected under pressure into a die or mold using using runners to direct the molten metal into a cavity or cavities, and cores if desired may also be introduced to make more complex shapes. For further information, reference is made to "Product Design For Die Casting", published in 1996 by the Diecasting Development Council, 4th Ed., Ch. 4, Pgs. 97-102, whose contents are herein incorporated by reference. Thus, the terms "molded", "injection-molded", "moldable", or "molding" as used herein should be understood in the broadest sense to include not only injection molding of plastics or other formable materials but also die casting of metals.

[0016] The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this disclosure. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which there are illustrated and described the preferred embodiments of the invention, like reference numerals or letters signifying the same or similar components.

SUMMARY OF THE DRAWINGS

[0017] In the drawings:

Fig. 1A shows, schematically, a conventional reel

of carrier parts;
Fig. 1B is an enlarged detail view of part of the conventional reel of carrier parts shown in Fig 1A;
Fig. 2A is a schematic view of a reel according to the invention containing one form of a carrier support in accordance with the invention;
Fig. 2B is a plan view of part of the carrier support on the reel of Fig. 2A;
Fig. 2C is an enlarged plan view of the carrier support of Fig. 2B,
Fig. 3 is a side view of the carrier support of Fig. 2C;
Fig. 4 is an end view of the carrier support of Fig. 3;
Fig. 5 is a detail view of the carrier support of Fig. 3 along the line 5-5;
Figs. 6A and 6B are plan and side views of the carrier support after the molding step but before insertion of the pins;
Fig. 7A, 7B, and 7C are plan, end and side views, respectively, of a strip of pins;
Fig. 8A is a perspective view schematically illustrating how the strips are molded to the molded bodies of component parts inside a mold section;
Fig. 8B is a cross-sectional detail view of part of the mold of Fig. 8A;
Fig. 9 is a schematic perspective view illustrating the fabrication of a continuous carrier in accordance with the invention;
Fig. 10 is a schematic perspective view illustrating how individual components can be separated from the carrier of Fig. 9 and picked up by a conventional pick-and-place system;
Fig. 11 is a perspective view of part of another series of strip-supported mechanical components, also showing one way of increasing the holding power of the strips;
Fig. 12 is a perspective view of part of another series of strip-supported components, also showing another way of separating a component from the strips;
Fig. 13 shows another form of structure for increasing the holding power of a strip;
Fig. 14 is a perspective view of part of another series of carrier-supported components using both a strip and a monofilament;
Fig. 15 is an end view of the carrier of Fig. 14.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0018] Figs. 1A and 1B are schematic views of a prior art reeled tape of electrical components. The reel 10 has reeled up on it a plastic tape 12 which is embossed to form a series of pockets 14 into each of which is placed a separately fabricated electrical component 16. The tape 12 has a series of sprocket holes 18 along one edge for advancing the tape. After the components 16 have been loaded into the tape pockets 14, a plastic cover strip 20 is sealed over the filled pockets 14 to prevent the components from falling out when the strip is reeled onto or unreeled from the reel 10. As will be observed from Fig. 1B, the components 16 typically have a flat top for receiving the end of a suction head for removing the component from the pocket and placing it on the PCB surface after the cover strip is removed. However, the part 16 is at or below the tape surface, making it difficult to use a mechanical gripper to remove the part, as the gripper would have to be inserted into the pocket 14 to grip the component sides below its exposed top. Moreover, the cost of fabricating the embossed tape and assembling the separately made components 16 to the tape is relatively high.

[0019] A principal feature of the invention is to encapsulate or attach one or a pair of carrier strips or filaments directly to a side portion of each of the components while a molded part of the latter is molded. The invention, instead of separately making the electrical components and embossed tape and assembling them, integrates a molding step of the components with attachment of the carrier support to a side portion of each component, hence eliminating the tape embossing step, the assembling step and the attachment of the cover strip step thereby greatly reducing the fabrication cost of a carrier strip loaded with electrical components. In comparison with the scheme described in the referenced commonly-owned patent, the invention allows the use of strips or filaments that are not of the same material as that of the molded component portion, and provides a continuous supply strip of components that allows the components to be readily separated from its supporting strip or filament by simply pulling the component off of its attachment.

[0020] Fig. 2A shows a reel 21 according to the invention containing one form of a carrier supply strip 22 according to the invention, and Fig. 2B is an enlarged plan view of part of the carrier strip 22 according to the invention supporting four components 24, in this instance pin headers with two rows of electrically-conductive pins 26. In the enlarged view of Fig. 2C, spaced plastic strips 28, 30 are provided from a reel, having been cut to the desired width and shape indicated in the figure by reference 32. The strip widths do not have to be the same. Along one strip edge is provided a series of round sprocket holes 34, and along the corresponding edge of the other strip is provided a series of oval sprocket holes 36. The round sprocket holes 34 are used to advance the strip in controlled steps by any known indexing device such as a controlled sprocket wheel. The oval holes 36, which are also engaged by a sprocket wheel, are slightly enlarged to accommodate variations and tolerences in the advancing drive.

[0021] The electrical components 24 in this embodiment are pin headers, two of which are shown spaced apart in the longitudinal direction of the carrier, and each of which comprises a molded plastic body 40 perforated with two rows of apertures 41 into which are inserted electrical pins 26. Each header encapsulates edge re-

gions 42 (Fig. 6A) along facing edges of the two strips 28, 30 which thus support the components 24 between the strips. The resultant supply strip 22 of edge-supported components 24 can now be wound up on the reel 21 for use by a component feeding device used with a mechanical pick-and-place device for gripping the component by one or more of its upstanding pins after it has been separated from its supporting strips 28, 30 for placement on a PCB to which it may be attached. If instead it is desired to use a pneumatic pick-and-place device, which requires a flat top surface for the suction head, a stiff plastic cover 44, shown in phantom, may be detachably assembled to the header 24 to supply the flat top, the cover 44 being removed from the header after the attaching step. Fig. 5 shows that an alignment notch 46 may be molded into the side of each header 24 to aid the feeder and/or pick-and-place device in locating the header.

[0022] Figs. 8A, 8B and 9 show one way by which the flexible strips 28, 30 can be molded to the header components 24. A strip of plastic 48 pre-stamped with the sprocket holes 34, 36 is supplied from a reel 50 and advanced by any known indexing mechanism, for example, sprocket wheels and a synchronous drive (not shown), through a conventional stamping die 52 which configures and forms the two side strips 28, 30. While Fig. 9 shows a starting strip 48 with the same width as the final product, and with the stamper 52 removing the center strip section to form the two side strips 28, 30, this is not essential. One can start with two prestamped narrower strips or with a single narrower strip which is stamped or slit to form the two side strips 28, 30. The latter are then processed 54 to encapsulate the strips 28, 30 into a series of molded components 24. One way of doing this, which is not to be considered limiting, is illustrated in Figs. 8A and 8B. The strips 28, 30 are indexed over the mold base or lower cavity B of an injection mold, the upper cavity A of which is a mirror image of the lower cavity. The lower cavity contains two mold sections 60, each configured to mold one of the header bodies 40. Each mold section 60 contains along opposite edges recessed regions 61 for receiving a strip (only the recess for the strip 30 is shown). When the upper cavity part A is closed over the lower cavity part B, the strips 28, 30 are clamped between the two mold parts, shown schematically in Fig. 8B. When molten plastic is injected into the closed mold in the usual way, the plastic body 40 of each header is molded, simultaneously encapsulating the edge regions 42 of both of the flexible strips. The apertures 41 in the header body 40 may be simultaneously molded by means of core pins (not shown) in the mold halves, or they can be punched in a subsequent step. Following cooling, the mold halves are opened, and the finished assembly 62 ejected from the mold, while simultaneously the assembly 62 is advanced to provide in the opened mold the next strip sections to be encapsulated into the next set of headers to be molded. The process is repeated until molded headers 40 have been attached to and suspended between the strips 28, 30 over their entire length.

[0023] Typically, posts 63 are provided for alignment of the mold halves. In addition, pins 63A are shown in the mold for engagement of the sprocket holes 34 to ensure proper alignment of the strips to the component. The pins 63A are shown enlarged for clarity. A recessed area 63B may be provided downstream of the cavities 60 for receiving the molded assembly 62 to prevent damage when the mold closes. In the schematic perspective of Fig. 9, the processing stage 54 is in line in the multiple stage processing starting from one supply reel 50 and ending at one take-up reel 21. Fig. 8A also illustrates an alternative scheme wherein, following the processing stage 52, the strips are reeled up to form a further supply reel 50A for processing stage 54, following which the strip-body assembly 62 is reeled up on a take-up reel 50B, which then acts as the supply for the next stage 70, and so on. This alternative scheme of reeling. and unreeling for one or more stages can also be applied to the other stages. It will also be understood that, while only two mold cavities 60 have been shown for simplicity, more than two cavities can be employed if desired to increase the number of parts per mold cycle.

[0024] Part of the assembly 62 in this intermediate condition following the molding operation is illustrated in Figs. 6A and 6B for a dual row header containing seven apertures 41 in each row. One of the aperture openings may be bevelled 64 for ease of insertion of the pins 26. The pins 26 can be supplied from a reel 65 as a continuous strip 66 (see Figs. 7A-7C also) with reduced thickness regions 68 for separation of the pins in a conventional inserter machine 70, illustrated schematically in Fig. 9, which also inserts them into the apertures 40 of the header bodies 40. If desired, a supply 72 of plastic caps 44 from a reel 74 is provided, individual caps 44 separated and attached to the headers 24 in a machine 76, and the modified assembly, which corresponds to the pinned assembly 22 of Fig. 2B, reeled up on a reel 21 typically with interleaf layer 22A for distribution or sale to the PCB fabricator.

[0025] At the plant of the fabricator, the carrier 22 is unreeled from the reel 21 and passed through a device 78 which pushes up (by means not shown) on each of the supporting tabs 29 of each of the strips 28, 30 with enough force, while the strips 28, 30 are tightly held, that the component 24 separates from its carrier strips 28, 30 and, while supported, the component can be picked up by a conventional pick-and-place device 80 having a suction head 82 which contacts and vacuum-attaches to the component cover 44. As the carrier 22 advances, a suction head 82 comes into position with each newly-severed component 24 and carries it to the PCB, places the component, and then returns to pick up another component from the carrier 22. The carrier strip residues 84, together with the usual paper interleaf 22A, are guided to a separate accumulation area for disposal.

[0026] A feature of the invention is that electrical or

mechanical components of most any size, shape or configuration can be accommodated on the flexible strips, provided that they include along their sides a moldable region, by which is meant a region that is fabricated by molding of a plastic resin and that will attach to the edges 42 of the plastic strips 28, 30. In the case of the header components 24 having plastic bodies 40, they can be made with one, two, or more rows containing anywhere from 2-22 or more pins per row. To realize this merely requires altering the width of each header, represented in Fig. 3 by the dimension 90, and altering the overall width of the assembly, represented in Fig. 3 by the dimension 92. For the examples given, the dimension 90 can vary between 0.48-5.56 cms (0.190-2.190 inches), and the dimension 92 can vary between 3.20-7.20 cms (1.260-2.835 inches) for typical pin spacings of 0.254 cm (0.100 inches). These numbers are merely exemplary and are not to be consided limiting.

[0027] The amount of the overlap of the edge regions 42 of the flexible strips 28, 30 with the mold sections, and thus the degree of encapsulation or attachment, controls the amount of pull-off force needed to separate each component 24 from its supporting strips. The pull-off force should be at least a minimum amount, to ensure that the electrical components 24 do not detach from their carrier during reeling and unreeling and normal handling before being deliberately separated at a time just before being picked-up by the pick-and-place device 82. Similarly, the pull-off force should not exceed a maximum amount, to ensure that any convenient separator force or separating device can be used to reliably separate a component from its carrier strips 28,30 without causing damage to the separated component or the components that remain behind. Experience has shown that, for the component examples given above, a pull-off force of about 1.36-2.27 kg (3-5 pounds) per side is adequate to satisfy both requirements. This pull-off force is achieved by a molded region 42 having a length indicated by 94 in Fig. 6A, for components of the size indicated above, preferably of about 0.508 cm (0.2 inches), and an overlap indicated by 96 preferably of about 3.81 - 5.08 $\times$ 10^{-2} cms (0.015-0.020 inches). Smaller components may use a smaller overlap, and larger components can use a larger overlap. In this regard, it is useful to provide separating notches 98 in both strips 28, 30 between the component supports. The notches 98 act to weaken the strip at the region of the notches and thus isolate adjacent components and prevent separating forces applied to one component from being transmitted to and damaging adjacent components. Alternatively, the weakened strip regions can be supplied by a series of perforations.

[0028] The invention is obviously not limited to pin header components and can be applied to any type of electrical or mechanical component part that have moldable side regions that can be molded to the flexible strips. Examples of other components are SMT jumpers or switches with plastic housings, plastic headers with sockets, and various mechanical components with plastic body parts. As a further example, Fig. 11 shows a plastic part with a screw top 100 mounted beween a pair of carrier strips 102 with opposite side regions of the plastic part 100 molded to the adjacent edges 104 of the carrier strips.

[0029] Preferably, the flexible strips 28, 30 are constituted of a high temperature plastic, such as polyesters commonly known as "Mylar". The high temperature property is desirable as the strip edges will be subjected to the elevated temperature of the injected molten plastic used for molding the components and encapsulating the strips. The molding plastic should similarly be able to withstand the elevated temperatures of the standard SMT reflow or wave-soldering process that the PCB will be subject to. Molding plastics with this property are well known in the art and are available commercially from suppliers such as GE and DuPont. These and other plastics will be obvious to those skilled in this art.

[0030] While, in the preferred embodiment, the strips are provided with built in advancing means in the form of the sprocket holes, this is not essential. The downstream end of a strip can be attached to a take-up reel or other pulling device for advancing the strip or filament. Alternatively, the edges of the strip or filament can be engaged by friction drive means for advancing purposes.

[0031] The invention is not limited to a pair of strips connected to opposite side regions of each component so that the components are suspended between the strips. With small components that are light in weight, one side support alone is sufficient to support a series of such components, for example, a small header with only 1 or 2 positions. Also, in the example so far given, the component is separated from the pair of supporting strips by an upward pushing force, which will tear the strip material at the component body, or pull out the strip material from the component body. This is not essential. With a one-carrier strip support, the component can be pulled laterally with respect to the longitudinal direction of the carrier to detach it from the carrier. Alternatively, the component at the leading edge of the strip can be pulled off frontwards with a force in the the longitudinal direction of the carrier to detach it from the carrier. While pulling or pushing on the carrier to detach the component from the carrier is preferred, depending upon the component size and the strength of the carrier, the component can also be separated from its carrier supports by pulling or pushing on the component or by severing it from its carrier supports. In any case, no harm results if part of the carrier strip is left in place in the detached component and protrudes from the component side. Fig. 12 illustrates header assemblies 106 supported by carrier strips 28, 30, with the leading assembly 108 separated from the strips by a force 110 exerted in the longitudinal direction of the strips. As a further alternative, with shorter components but the same carrier width, it is possible to use tabs 29 of the same length and with

the molding extended from the component sides by thin tabs which are molded and attached to the strip tabs 29. In this case, cutting of the molded component tabs instead of the strip tabs would be preferred.

[0032] From a different aspect, if the attachment between the strip or filament and the moldable edge of the component is too weak, the attachment can be enhanced by adding holding structure to the strip edge. For example, as illustrated in Fig. 11, holes 114 can be punched into the strip edge region to be encapsulated. During the molding process, plastic fills the hole and reinforces the strength of the attachment of the component side to the carrier strip. Fig. 13 shows a modification for the holding structure using small slits 116 in the strip 118 to increase the holding power to the component. This may be desirable when the components are supported by only one side strip 118 or filament. Other holding structure can also be substituted, such as dimples or rough edges or other means to increase the holding surface area.

[0033] In the preferred embodiment, a pair of flexible plastic strips serve as the carrier for the series of components. While preferred, this is not essential. The carrier can also be constituted of a single flexible plastic strip attached along one side of each component or of a single or pairs of flexible paper strips or metal strips that will attach to plastic. For example, copper or aluminum foil strips, for example, $0.76\text{-}1.27 \times 10^{-2}$ cm (0.003-0.005 inches) in thickness, are flexible and can be attached by molding to most plastics and can be substituted for the plastic strips. Also, the invention is not limited to strips and can also be implemented by a single flexible filament or pair of filaments, of plastic or metal, which is attached by molding to a side, or encapsulated by molding in the side, of the molded region of a component. A weakened region for easy separation of the component from its supporting filament can be provided by reduced thickness regions in the filament just above and below where it attaches to each component. This is illustrated in Figs. 14 and 15, which shows a series of pinless headers 120 each supported at molded side regions 122 by a strip 124 of plastic, metal or fiber on one side, and by a monofilament 126 of plastic or metal molded into the opposite side region 128.

[0034] As before, when assembled, the resultant supply strip of carrier-supported components can be reeled up on a reel for distribution or sale. A feature of the invention is that a large number of components supported as described above can be supplied to the PCB fabricators for handling with the same kind of reel-supplied equipment that is presently in wide use. Hence, typically such a reel according to the invention will comprise at least 1.829 m (six feet) of a supply strip of components, which depending on component size can amount to hundreds of components supplied via a single reel.

[0035] While the invention has been described in connection with preferred embodiments, it will be understood that modifications thereof within the principles outlined above will be evident to those skilled in the art and thus the invention is not limited to the preferred embodiments but is intended to encompass such modifications.

Claims

1. A continuous carrier strip (22) of electrical or mechanical components, comprising:

   a) at least one, continuous, flexible filament (126) or flexible strip (28, 30; 102, 102; 118; 124) having a longitudinal direction,

   b) a series of electrical or mechanical components (24, 40, 100, 106, 120) each having at least one moldable edge molded to and detachably attached to a region of the filament or an edge region of the flexible strip to form a continuous carrier strip (22) containing a plurality of longitudinally-spaced components, the molded connection between the moldable edge of the components and the region of the filament or edge region of the flexible strip being such that individual components (24, 40, 100, 106, 120) will remain attached to the filament or strip during normal handling of the filament- or strip-supported components but the components can be separated from the filament or strip by an applied separating force without damaging adjacent components.

2. A continuous carrier strip as claimed in Claim 1, wherein the filament or strip has a weakened region (98) between each of its molded connections to the longitudinally-spaced components.

3. A continuous carrier strip as claimed in Claim 1, wherein the filament or strip is constituted of plastic, paper, or metal that is a different composition than that of the moldable edge.

4. A continuous carrier strip as claimed in Claim 3, wherein only a single filament or strip is attached to only one side of each of the components.

5. A continuous carrier strip as claimed in Claim 3, wherein a pair of spaced parallel filaments or strips is attached each to only one or the opposite side of each of the components.

6. A continuous carrier strip (22) of electrical or mechanical components, comprising:

   a) a pair of spaced, parallel, continuous, flexible strips (28, 30; 102, 102; 118; 124) having a longitudinal direction and having along at least one edge structure (34, 36) for advancing the strips,

b) a series of electrical or mechanical components (24, 40, 100, 106, 120) having opposed moldable edges molded to and detachably suspended between inside facing edge regions of the flexible strips to form a continuous carrier strip containing a plurality of longitudinally-spaced components, the molded connection between the moldable edges of the components and the facing edge regions of the flexible strips being such that individual components will remain attached to the strips during normal handling of the strip-supported components but the components can be separated from the strips by an applied separating force without affecting adjacent components.

7. A continuous carrier strip according to Claim 6, wherein the component's (24, 40, 100, 106, 120) moldable edge is constituted of plastic and the flexible strips (28, 30; 102. 102; 118; 124) are of a different plastic.

8. A continuous carrier strip according to Claim 7, wherein the flexible strips are of a polyester plastic.

9. A continuous strip according to Claim 6, wherein the components (24) are plastic headers (40) comprising one or more rows of spaced electrical pins (26).

10. A continuous carrier strip according to Claim 6, wherein edge regions of the flexible strips (28, 30; 102, 102; 118; 124) are encapsulated in the moldable edges of the components (24, 40, 100, 106, 120).

11. A continuous carrier strip according to Claim 10, wherein the encapsulation is such that between 1.36-2.27 kg (3-5 lbs) of pull-off force is needed to separate individual components from the flexible strips.

12. A continuous carrier strip as claimed in Claim 6, wherein each of the strips has a weakened region (98) between each of its molded connections to the longitudinally-spaced components (24, 40, 100, 106, 120).

13. A continuous carrier strip according to Claim 1, further comprising a removable cover (44) over and removably attached to at least part of the component (24), said removable cover having a surface configured for co-operating with a pneumatic pick-and-place device.

14. A continuous carrier strip according to Claim 1, further comprising means (114, 116) at the molded connection for strengthening the attachment between the moldable edge of the electrical components and the region of the filament or edge region of the flexible strip (102, 118).

15. A continuous carrier strip according to Claim 14, wherein the means for strengthening the attachment comprises holes (114) or slits (116) or surface features at the region of the filament or edge region of the flexible strip.

16. A reel (21, 50B) and wound up on the reel a continuous carrier strip (22) according to Claim 1.

17. A reel according to Claim 16, wherein the continuous carrier strip is at least 1.83 metres (6 feet) long.

18. A method of fabricating a continuous carrier strip (22) of electrical or mechanical components (24, 40, 100, 106, 120) comprising:

a) providing at least one, continuous, flexible filament (126) or flexible strip (28, 30; 102; 118; 124),
b) providing a mold (A, B) with sections (60) for the components, said mold having along a side a region (61) for receiving the flexible filament or strip such that their edge overlaps an edge of the mold sections (60),
c) clamping with the mold (A, B) portions of the flexible filament or strip such that a side region overlaps an edge of the mold sections,
d) injecting a moldable material into the mold to form at least part of the components molded to and encapsulating an edge region of the flexible filament or strip,
e) removing the molded components with encapsulated filament or strip from the mold and advancing the flexible filament or strip until next following portions of the filament or strip are in position to be clamped to the mold,
f) repeating steps c), d) and e) at least once to form a series of spaced components (40) molded along a side to and detachably attached to an edge region of the flexible filament or strip to form a continuous carrier strip containing a plurality of the components,
g) the molded connection between the moldable edge of the components and the attached region of the filament or edge region of the flexible strip being such that individual components will remain attached to the filament or strip during normal handling of the filament- or strip-supported components but the components can be separated from the filament or strip by an applied separating action without damaging adjacent components.

19. The method of Claim 18, wherein the separating action is a pulling or pushing force.

20. The method of Claim 18, wherein the separating action is a cutting action.

21. A method of fabricating a continuous carrier strip (22) of electrical components (24, 40, 106, 120), comprising:

a) providing a pair of spaced, parallel, continuous, flexible strips (28, 30) having along at least one edge structure (34, 36) for advancing the strips,
b) providing a mold (A, B) with sections (60) for electrical components, said mold having along opposite sides regions for receiving the flexible strips such that their inside facing edges overlap opposite edges of the mold sections (60),
c) clamping with the mold portions of the flexible spaced strips such that inside edge regions overlap opposite edges of the mold sections,
d) injecting plastic into the mold to form at least part of the electrical components molded to and encapsulating the edge regions of the spaced strips (28, 30),
e) removing the molded components (24, 40, 106, 120) with encapsulated strips from the mold and advancing the flexible strips until next following portions of the moldable strips are in position to be clamped to the mold,
f) repeating steps c), d) and e) at least once to form a series of spaced electrical components molded to and detachably suspended between inside facing edge regions of the flexible strips to form a continuous carrier strip containing a plurality of the electrical components,
g) the molded connection between the moldable edges of the electrical components and the facing edge regions of the flexible strips being such that individual electrical components will remain attached to the strips during normal handling of the strip-supported components but the components can be separated from the strips by an applied separating force.

22. The method of Claim 21, wherein the flexible strips are of a polyester plastic that is different from the plastic used to mold part of the components.

23. The method according to Claim 21, wherein the electrical components are plastic headers (40).

24. The method according to Claim 23, wherein, following step g), spaced electrical pins (26) are inserted into the plastic headers (40).

25. The method according to Claim 21, wherein, following step g), reeling the continuous carrier strip onto a reel (21, 50B).

Patentansprüche

1. Fortlaufender Trägerstreifen (22) für elektrische oder mechanische Bauteile mit:

a) zumindest einem fortlaufenden flexiblen Faden (126) oder flexiblen Streifen (28, 30; 102, 102; 118; 124) mit einer Längsrichtung,

b) einer Reihe von elektrischen oder mechanischen Bauteilen (24, 40, 100, 106, 120) mit jeweils zumindest einer verformbaren Kante, die an einen Bereich des Fadens oder einen Kantenbereich des flexiblen Streifens angeformt und lösbar daran angebracht ist, um einen fortlaufenden Trägerstreifen (22) zu bilden, welcher mehrere in Längsrichtung beabstandete Bauteile enthält, wobei die geformte Verbindung zwischen der verformbaren Kante der Bauteile und dem Bereich des Fadens oder dem Kantenbereich des flexiblen Streifens so gestaltet ist, dass einzelne Bauteile (24, 40, 100, 106, 120) während normaler Handhabung der durch den Faden oder den Streifen gehaltenen Bauteile mit dem Faden oder dem Streifen verbunden bleiben, wobei aber die Bauteile von dem Faden oder Streifen durch Aufbringen einer Trennkraft getrennt werden können, ohne dass benachbarte Bauteile beschädigt werden.

2. Fortlaufender Trägerstreifen nach Anspruch 1, wobei der Faden oder Streifen einen geschwächten Bereich (98) zwischen allen geformten Verbindungen mit den in Längsrichtung beabstandeten Bauteilen aufweist.

3. Fortlaufender Trägerstreifen nach Anspruch 1, wobei der Faden oder Streifen aus Plastik, Papier oder Metall besteht, welches anders zusammengesetzt ist als die verformbare Kante.

4. Fortlaufender Trägerstreifen nach Anspruch 3, wobei nur ein einziger Faden oder Streifen an nur einer Seite der Bauteile angebracht ist.

5. Fortlaufender Trägerstreifen nach Anspruch 3, wobei ein Paar von voneinander beabstandeten, parallel verlaufenden Fäden oder Streifen jeweils nur an einer oder der gegenüberliegenden Seite der Bauteile angebracht ist.

6. Fortlaufender Trägerstreifen (22) für elektrische oder mechanische Bauteile mit:

a) einem Paar von voneinander beabstandeten, parallelen, fortlaufenden, flexiblen Streifen (28, 30; 102, 102; 118; 124) mit einer Längsrichtung und entlang zumindest einer Kante mit

einer Struktur (34, 36) zum Fortbewegen der Streifen,

b) einer Reihe von elektrischen oder mechanischen Bauteilen (24, 40, 100, 106, 120) mit gegenüberliegenden verformbaren Kanten, die zwischen nach innen zeigenden Kantenbereichen der flexiblen Streifen angeformt und lösbar daran angebracht sind, um einen fortlaufenden Trägerstreifen mit mehreren in Längsrichtung voneinander beabstandeten Bauteilen zu bilden, wobei die geformte Verbindung zwischen den verformbaren Kanten der Bauteile und den einander zugewandten Kantenbereichen der flexiblen Streifen so gestaltet ist, dass einzelne Bauteile während normaler Handhabung der durch die Streifen gehaltenen Bauteile an den Streifen angebracht bleiben, wobei jedoch die Bauteile durch Aufbringen einer Trennkraft von den Streifen getrennt werden können, ohne dass benachbarte Bauteile beschädigt werden.

7. Fortlaufender Trägerstreifen nach Anspruch 6, wobei die verformbare Kante der Bauteile (24, 40, 100, 106, 120) aus Plastik besteht und wobei die flexiblen Streifen (28, 30; 102, 102; 118; 124) aus einem anderen Plastik bestehen.

8. Fortlaufender Trägerstreifen nach Anspruch 7, wobei die flexiblen Streifen aus einem Polyesterplastik bestehen.

9. Fortlaufender Streifen nach Anspruch 6, wobei die Bauteile (24) Plastiksockel (40) sind, welche eine oder mehrere Reihen von voneinander beabstandeten elektrischen Stiften (26) aufweisen.

10. Fortlaufender Trägerstreifen nach Anspruch 6, wobei Kantenbereiche der flexiblen Streifen (28, 30; 102, 102; 118; 124) in den verformbaren Kanten der Bauteile (24, 40, 100, 106, 120) eingebettet sind.

11. Fortlaufender Trägerstreifen nach Anspruch 10, wobei die Einbettung derart gestaltet ist, dass zwischen 1,236 und 2,27 kg (3-5 lbs) einer Abziehkraft notwendig sind, um einzelne Bauteile von den flexiblen Streifen zu trennen.

12. Fortlaufender Trägerstreifen nach Anspruch 6, wobei jeder der Streifen einen geschwächten Bereich (98) zwischen allen geformten Verbindungen mit den in Längsrichtung voneinander beabstandeten Bauteilen (24, 40, 100, 106, 120) aufweist.

13. Fortlaufender Trägerstreifen nach Anspruch 1, welcher außerdem eine abnehmbare Abdeckung (44) aufweist, die zumindest einen Teil des Bauteils (24) abdeckt und lösbar daran angebracht ist, wobei diese abnehmbare Abdeckung eine Oberfläche hat, die für ein Zusammenwirken mit einer pneumatischen Beschickungseinrichtung ausgestaltet ist.

14. Fortlaufender Trägerstreifen nach Anspruch 1, welcher außerdem Mittel (114, 116) an der geformten Verbindung zum Verstärken der Befestigung zwischen der verformbaren Kante der elektrischen Bauteile und dem Bereich des Fadens oder dem Kantenbereich des flexiblen Streifens (102, 118) aufweist.

15. Fortlaufender Trägerstreifen nach Anspruch 14, wobei die Mittel zum Verstärken der Befestigung Öffnungen (114) oder Schlitze (116) oder Oberflächenmerkmale im Bereich des Fadens oder im Kantenbereich des flexiblen Streifens aufweisen.

16. Haspel (21, 50B) mit einem darauf aufgewickelten fortlaufenden Trägerstreifen (22) nach Anspruch 1.

17. Haspel nach Anspruch 16, wobei der fortlaufender Trägerstreifen zumindest 1,83 Meter (6 Fuß) lang ist.

18. Verfahren zur Herstellung eines fortlaufenden Trägerstreifens (22) für elektrische oder mechanische Bauteile (24, 40, 100, 106, 120) mit den folgenden Schritten:

a) Vorsehen zumindest eines fortlaufenden flexiblen Fadens (126) oder flexiblen Streifens (28, 30; 102; 118; 124),

b) Vorsehen einer Gussform (A, B) mit Abschnitten (60) für die Bauteile, wobei die Gussform entlang einer Seite einen Bereich (61) zur Aufnahme des flexiblen Fadens oder Streifens hat, so dass deren Kante eine Kante des Gussabschnitts (60) überlappt,

c) Verklemmen von Bereichen des flexiblen Fadens oder Streifens mit der Gussform (A, B), so dass ein Seitenbereich eine Kante der Gussabschnitte überlappt,

d) Einspritzen eines verformbaren Materials in die Gussform, um zumindest einen Teil der Bauteile zu formen, die an einen Kantenbereich des flexiblen Fadens oder Streifens angeformt und darin eingebettet sind,

e) Entfernen der geformten Bauteile mit dem darin eingebetteten Faden oder Streifen aus der Gussform und Weiterführen des flexiblen Fadens oder Streifens, bis nachfolgende Abschnitte des Fadens oder Streifens sich an ei-

ner Position befinden, in der sie mit der Gussform verklemmt werden können,

f) Wiederholen der Schritte c), d) und e) zumindest einmal, um eine Reihe von voneinander beabstandeten Bauteilen (40) zu bilden, die entlang einer Seite an einen Kantenbereich des flexiblen Fadens oder Streifens angeformt und lösbar daran angebracht sind, um einen fortlaufenden Trägerstreifen mit mehreren Bauteilen zu bilden,

g) wobei die geformte Verbindung zwischen der verformbaren Kante der Bauteile und dem angebrachten Bereich des Fadens oder dem Kantenbereich des flexiblen Streifens so ist, dass einzelne Bauteile mit dem Faden oder Streifen während normaler Handhabung der von dem Faden oder Streifen gehaltenen Bauteile befestigt bleiben, wobei jedoch die Bauteile von dem Faden oder Streifen durch Aufbringen einer Trennkraft getrennt werden können, ohne benachbarte Bauteile zu beschädigen.

19. Verfahren nach Anspruch 18, wobei die Trennkraft eine Zug- oder Druckkraft ist.

20. Verfahren nach Anspruch 18, wobei die Trennkraft eine Schneidkraft ist.

21. Verfahren zur Herstellung eines fortlaufenden Trägerstreifens (22) für elektrische Bauteile (24, 40, 106, 120) mit den folgenden Schritten:

a) Vorsehen eines Paars von voneinander beabstandeten, parallelen, fortlaufenden ,flexiblen Streifen (28, 30), welche zumindest entlang einer Kante eine Struktur (34, 36) zum Fortbewegen der Streifen aufweisen,

b) Vorsehen einer Gussform (A, B) mit Abschnitten (60) für elektrische Bauteile, wobei die Gussform entlang gegenüberliegenden Seiten Bereiche zum Aufnehmen des flexiblen Streifens hat, so dass deren nach innen weisenden Kanten gegenüberliegende Kanten der Gussbereiche (60) überlappen,

c) Verklemmen von Bereichen der flexiblen beabstandeten Streifen mit der Gussform, so dass innere Kantenbereiche gegenüberliegende Kanten der Gussbereiche überlappen,

d) Einspritzen von Plastik in die Gussform, um zumindest einen Teil der elektrischen Bauteile zu bilden, die an die Kantenbereiche der beabstandeten Streifen (28, 30) angeformt sind und diese einbetten,

e) Entfernen der geformten Bauteile (24, 40, 106, 120) mit eingebetteten Streifen aus der Gussform und Weiterführen der flexiblen Streifen, bis nachfolgende Abschnitte der verformbaren Streifen in einer Stellung sind, in der sie mit der Gussform verklemmt werden können,

f) Wiederholen der Schritte c), d) und e) zumindest einmal, um eine Reihe von beabstandeten elektrischen Bauteilen zu bilden, die zwischen nach innen weisende Kantenbereiche der flexiblen Streifen angeformt und lösbar daran angebracht sind, um einen fortlaufenden Trägerstreifen mit mehreren elektrischen Bauteilen zu bilden,

g) wobei die geformte Verbindung zwischen den verformbaren Kanten der elektrischen Bauteile und den zueinander weisenden Kantenbereichen der flexiblen Streifen so ist, dass einzelne elektrische Bauteile während normaler Handhabung der durch die Streifen gehaltenen Bauteile an den Streifen angebracht bleiben, wobei jedoch die Bauteile durch Aufbringen einer Trennkraft von den Streifen getrennt werden können.

22. Verfahren nach Anspruch 21, wobei die flexiblen Streifen aus einem Polyesterplastik bestehen, welches verschieden von dem Plastik ist, das zum Formen eines Teils der Bauteile verwendet wird.

23. Verfahren nach Anspruch 21, wobei die elektrischen Bauteile Plastiksockel (40) sind.

24. Verfahren nach Anspruch 23, wobei anschließend an den Schritt g) beabstandete elektrische Stifte (26) in die Plastiksockel (40) eingesetzt werden.

25. Verfahren nach Anspruch 21, wobei anschließend an Schritt g) der fortlaufende Trägerstreifen auf einen Haspel (21, 50B) aufgewickelt wird.

Revendications

1. Bande de support en continu (22) de composants électriques ou mécaniques, comprenant :

a) au moins un filament souple, continu (126) ou une bande souple (28, 30 ; 102, 102 ; 118 ; 124) présentant une direction longitudinale,
b) une série de composants électriques ou mécaniques (24, 40, 100, 106, 120) ayant chacun au moins un bord pouvant être moulé, moulé sur une région du filament ou une région de bord de la bande souple et fixé de façon amovible à celle-ci en vue de réaliser une bande de

support en continu (22) comportant une pluralité de composants espacés longitudinalement, le raccordement moulé entre le bord pouvant être moulé des composants et la région du filament ou la région de bord de la bande souple étant tel que des composants individuels (24, 40, 100, 106, 120) resteront fixés au filament ou à la bande durant une manipulation normale des composants supportés par le filament ou la bande mais les composants peuvent être séparés du filament ou de la bande par une force de séparation appliquée sans endommager des composants adjacents.

2. Bande de support en continu selon la revendication 1, dans laquelle le filament ou la bande comporte une région affaiblie (98) entre chacun de ses raccordements moulés aux composants espacés longitudinalement.

3. Bande de support en continu selon la revendication 1, dans laquelle le filament ou la bande est constitué de matière plastique, de papier ou de métal qui est d'une composition différente de celle du bord pouvant être moulé.

4. Bande de support en continu selon la revendication 3, dans laquelle uniquement un seul filament ou une seule bande est fixé à uniquement un côté de chacun des composants.

5. Bande de support en continu selon la revendication 3, dans laquelle une paire de filaments ou de bandes parallèles espacés sont fixés chacun à un seul côté ou au côté opposé de chacun des composants.

6. Bande de support en continu (22) de composants électriques ou mécaniques, comprenant :

a) une paire de bandes espacées, parallèles, continues, souples (28, 30 ; 102, 102 ; 118 ; 124) présentant une direction longitudinale et comportant le long d'au moins un bord une structure (34, 36) destinée à faire avancer les bandes,
b) une série de composants électriques ou mécaniques (24, 40, 100, 106, 120) ayant des bords pouvant être moulés opposés, moulés sur des régions des bords intérieurs en regard des bandes souples et suspendus de façon amovible entre celles-ci en vue de réaliser une bande de support en continu contenant une pluralité de composants espacés longitudinalement, le raccordement moulé entre les bords pouvant être moulés des composants et les régions des bords en regard des bandes souples étant tel que les composants individuels resteront fixés aux bandes durant une manipulation normale des composants portés par la bande mais les composants peuvent être séparés des bandes grâce à une force de séparation appliquée sans affecter de composants adjacents.

7. Bande de support en continu selon la revendication 6, dans laquelle le bord pouvant être moulé du composant (24, 40, 100, 106, 120) est constitué de matière plastique et les bandes souples (28, 30 ; 102, 102 ; 118 ; 124) sont d'une matière plastique différente.

8. Bande de support en continu selon la revendication 7, dans laquelle les bandes souples sont en matière plastique de polyester.

9. Bande de support en continu selon la revendication 6, dans laquelle les composants (24) sont des barrettes de matière plastique (40) comprenant une ou plusieurs rangées de broches électriques espacées (26).

10. Bande de support en continu selon la revendication 6, dans laquelle les régions de bord des bandes souples (28, 30 ; 102, 102 ; 118 ; 124) sont encapsulées dans les bords pouvant être moulés des composants (4, 40, 100, 106, 120).

11. Bande de support en continu selon la revendication 10, dans laquelle l'encapsulation est telle qu'entre 1,36 et 2,27 kg (3 à 5 livres) de force de détachement sont nécessaires pour séparer les composants individuels des bandes souples.

12. Bande de support en continu selon la revendication 6, dans laquelle chacune des bandes comporte une région affaiblie (96) entre chacun de ses raccordements moulé sur les composants espacés longitudinalement (24, 40, 100, 106, 120).

13. Bande de support en continu selon la revendication 1, comprenant en outre un couvercle amovible (44) sur au moins une partie du composant (24) et fixé de façon amovible à celle-ci, ledit couvercle amovible comportant une surface configurée pour coopérer avec un dispositif de transfert pneumatique.

14. Bande de support en continu selon la revendication 1, comprenant en outre un moyen (114, 116) au niveau du raccordement moulé destiné à renforcer la fixation entre le bord pouvant être moulé des composants électriques et la région du filament ou la région de bord de la bande souple (102, 118).

15. Bande de support en continu selon la revendication 14, dans laquelle le moyen destiné à renforcer la fixation comprend des trous (114) ou des fentes (116) ou des éléments de surface au niveau de la

région du filament ou de la région de bord de la bande souple.

16. Bobine (21, 50B) et enroulement sur la bobine d'une bande de support en continu (22) selon la revendication 1.

17. Bobine selon la revendication 16, dans laquelle la bande de support en continu présente une longueur d'au moins 1,83 mètres (6 pieds).

18. Procédé de fabrication d'une bande de support en continu (22) de composants électriques ou mécaniques (24, 40, 100, 106, 120) comprenant :

a) fournir au moins un filament souple continu (126) ou une bande souple (28, 30 ; 102, 102 ; 118 ; 124),
b) fournir un moule (A, B) muni de sections (60) pour les composants, ledit moule comportant le long d'un côté une région (61) destinée à recevoir le filament ou la bande souple de sorte que leur bord chevauche un bord des sections du moule (60),
c) serrer avec le moule (A, B) des parties du filament ou de la bande souple de sorte qu'une région latérale chevauche un bord des sections du moule,
d) injecter un matériau pouvant être moulé dans le moule en vue de réaliser au moins une pièce des composants moulés sur une région de bord du filament ou de la bande souple et encapsulant celle-ci,
e) enlever les composants moulés avec le filament ou la bande encapsulé du moule et faire avancer le filament ou la bande souple jusqu'à ce que les prochaines parties suivantes du filament ou de la bande soient en position pour être serrées sur le moule,
f) répéter les étapes c), d) et e) au moins une fois en vue de réaliser une série de composants espacés (40) moulés le long d'un côté sur une région de bord du filament ou de la bande souple et fixés de façon amovible à celle-ci en vue de constituer une bande de support en continu contenant une pluralité de composants,
g) le raccordement moulé entre le bord pouvant être moulé des composants et la région fixée du filament ou la région de bord de la bande souple étant tel que des composants individuels resteront fixés au filament ou à la bande durant une manipulation normale des composants supportés par le filament ou la bande mais les composants peuvent être séparés du filament ou de la bande grâce à une action de séparation appliquée sans endommagement des composants adjacents.

19. Procédé selon la revendication 18, dans lequel l'action de séparation est une force de traction ou de poussée,

20. Procédé selon la revendication 18, dans lequel l'action de séparation est une action de coupe.

21. Procédé de fabrication d'une bande de support en continu (22) de composants électriques (24, 40, 106, 120) comprenant :

a) fournir une paire de bandes espacées, parallèles, continues, souples (28, 30) comportant le long d'au moins un bord une structure (34, 36) destinée à faire avancer les bandes,
b) fournir un moule (A, B) muni de sections (60) pour des composants électriques, ledit moule comportant le long de côtés opposés, des régions destinées à recevoir les bandes souples de sorte que leurs bords intérieurs en regard chevauchent des bords opposés des sections du moule (60),
c) serrer avec le moule des parties des bandes espacées souples de sorte que des régions des bords intérieurs chevauchent des bords opposés des sections du moule,
d) injecter une matière plastique dans le moule en vue de former au moins une partie des composants électriques moulés sur les régions de bord des bandes espacées (28, 30) et encapsulant celles-ci,
e) enlever les composants moulés (24, 40, 106, 120) avec les bandes encapsulées du moule et faire avancer les bandes souples jusqu'à ce que les prochaines parties suivantes des bandes pouvant être moulées soient en position pour être serrées sur le moule,
f) répéter les étapes c), d) et e) au moins une fois en vue de former une série de composants électriques espacés moulés sur des régions des bords intérieurs en regard des bandes souples et suspendus de façon amovible entre celles-ci en vue de constituer une bande de support en continu contenant une pluralité de composants électriques,
g) le raccordement moulé entre les bords pouvant être moulés des composants électriques et les régions des bords en regard des bandes souples étant tels que les composants électriques individuels resteront fixés aux bandes durant une manipulation normale des composants supportés par la bande mais les composants peuvent être séparés des bandes par une force de séparation appliquée.

22. Procédé selon la revendication 21, dans lequel les bandes souples sont en matière plastique de polyester qui est différente de la matière plastique utili-

sée pour mouler une partie des composants.

23. Procédé selon la revendication 21, dans lequel les composants électriques sont des barrettes en matière plastique (40).

24. Procédé selon la revendication 23, dans lequel, après l'étape g), des broches électriques espacées (26) sont insérées dans les barrettes en matière plastique (40).

25. Procédé selon la revendication 21, dans lequel, après l'étape g), on bobine la bande de support en continu sur une bobine (21, 50B).

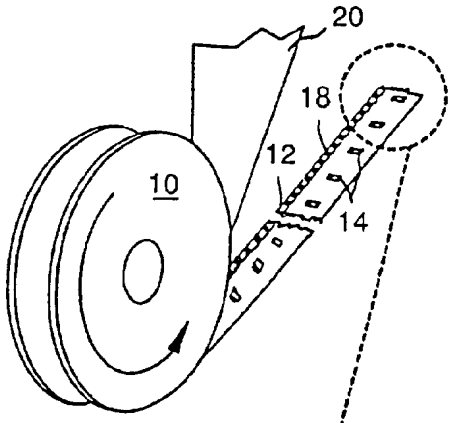

Fig. 1A
PRIOR ART

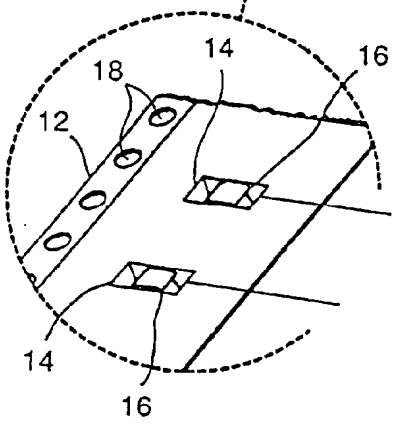

Fig. 1B
PRIOR ART

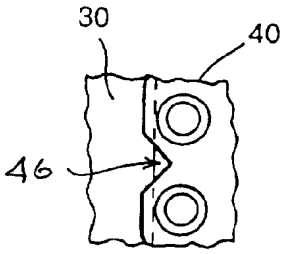

Fig. 5

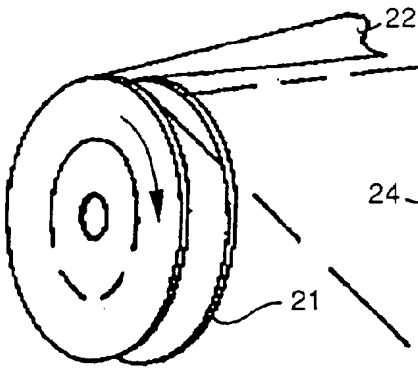

Fig. 2A

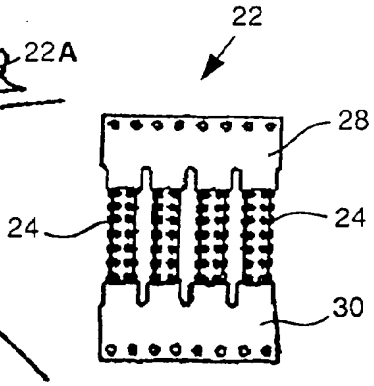

Fig. 2B

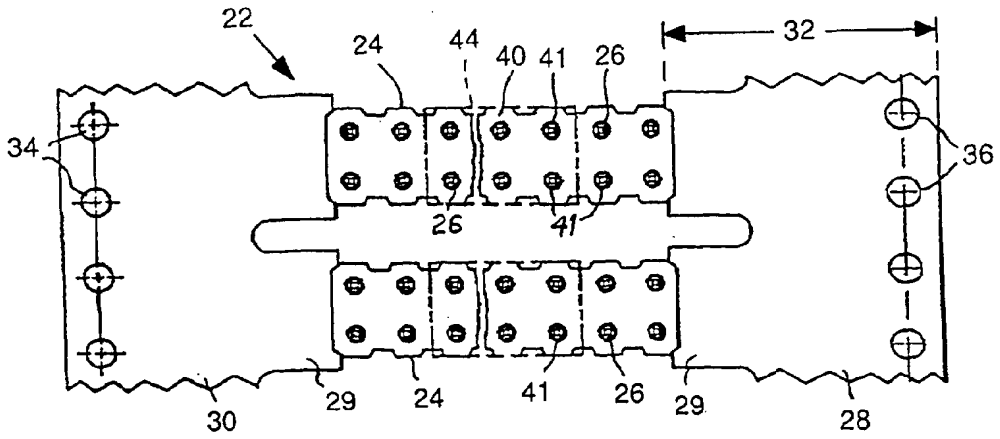

Fig. 2C

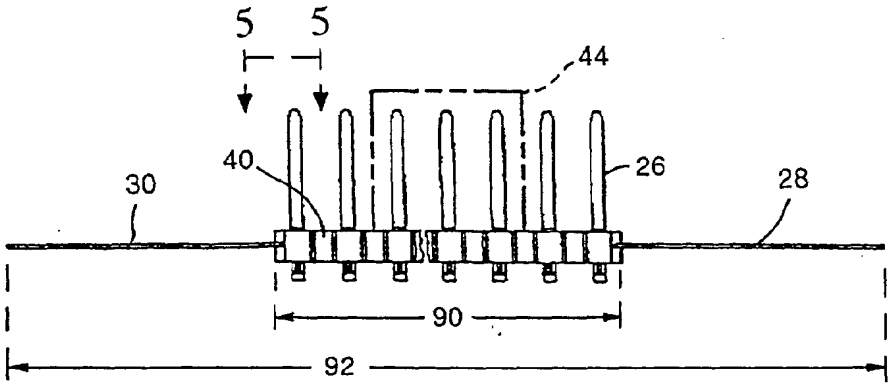

Fig. 3

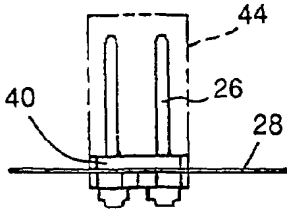

Fig. 4

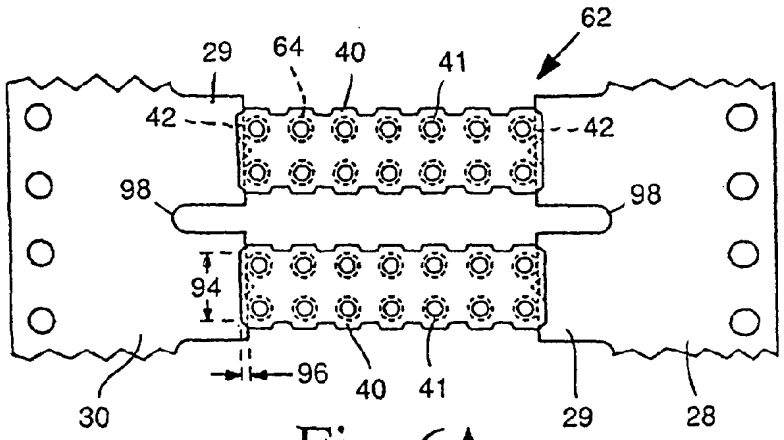

Fig. 6A

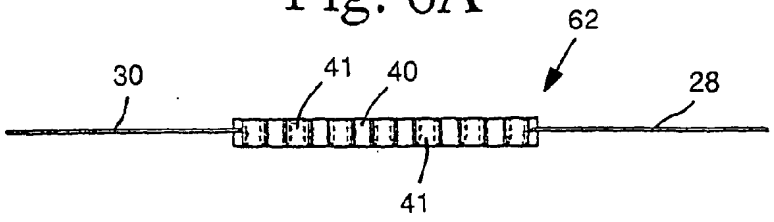

Fig. 6B

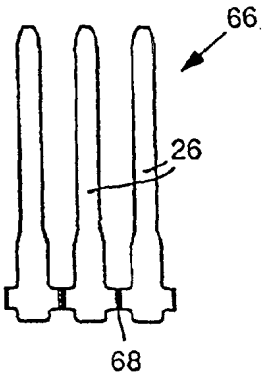

Fig. 7A

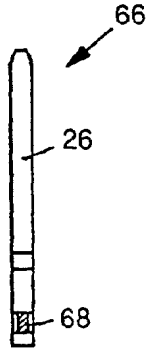

Fig. 7B

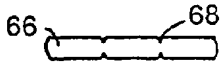

Fig. 7C

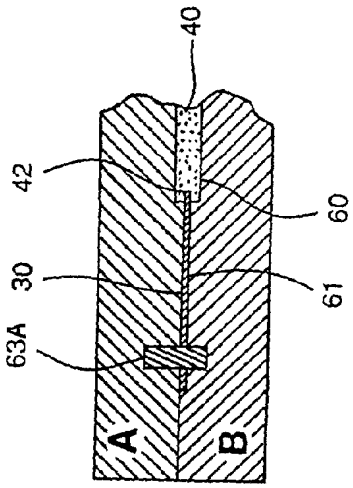
40
42
60
30
61
63A
A
B

Fig. 8B

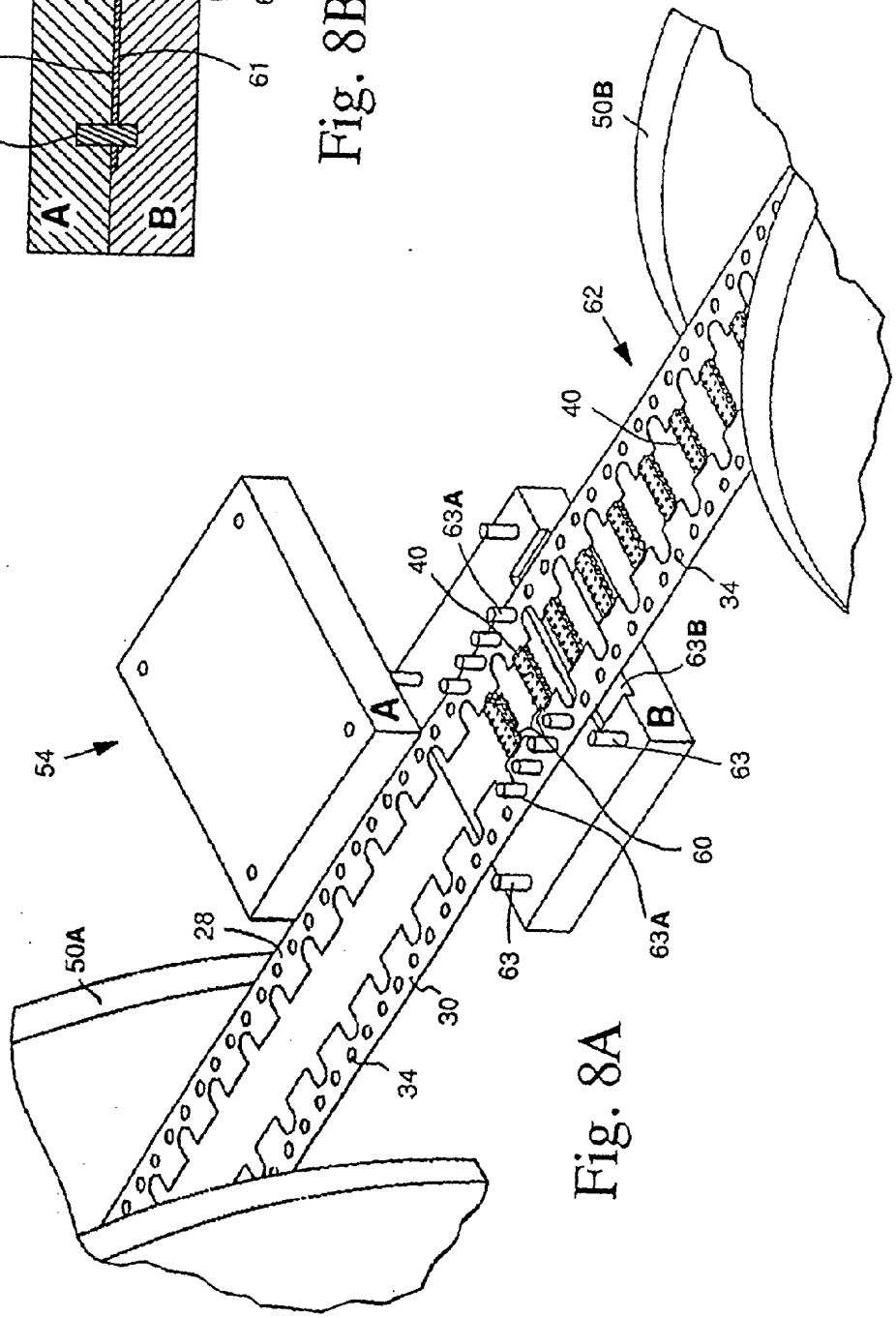
50B
62
40
63A
40
34
63B
54
A
B
63
60
28
50A
63
63A
30
34

Fig. 8A

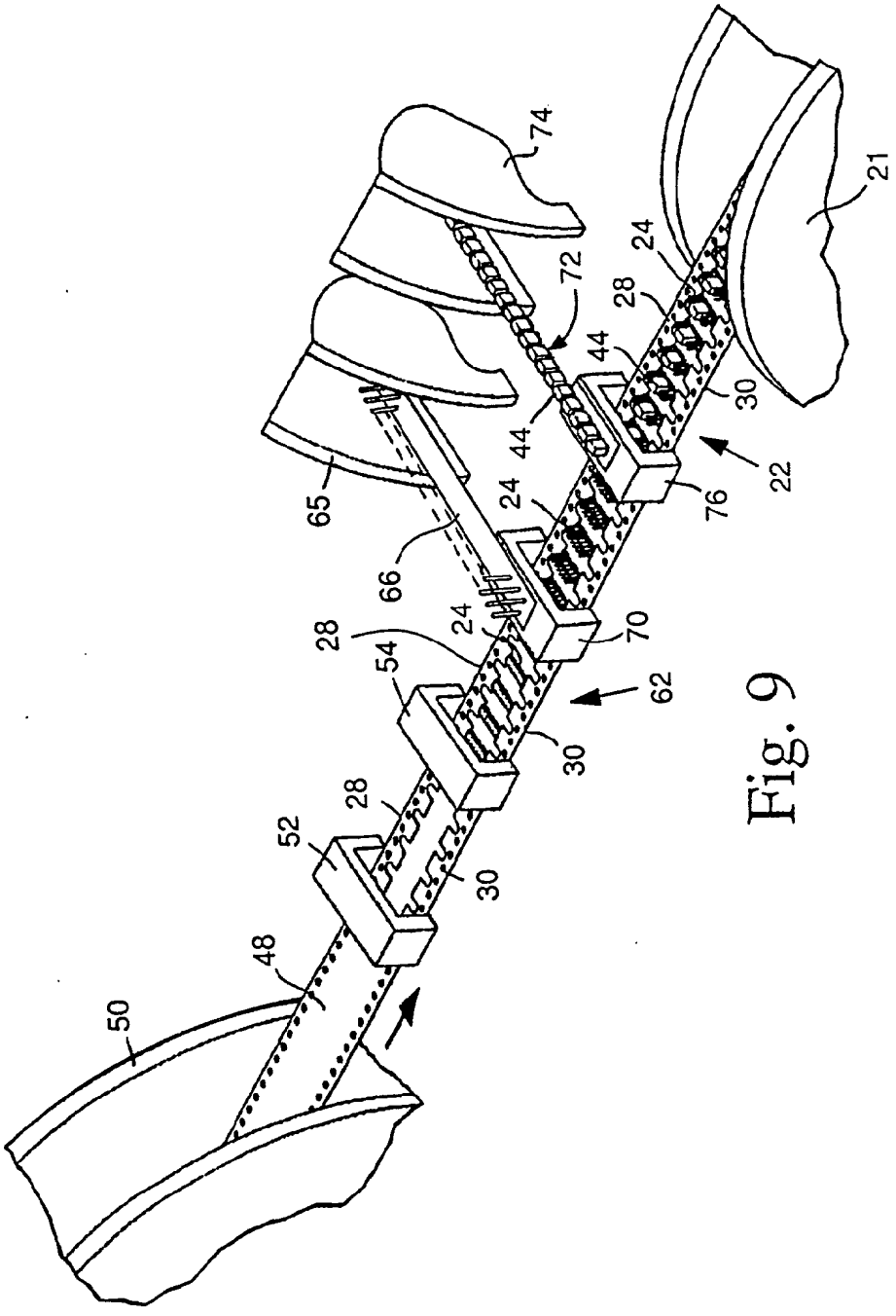

Fig. 9

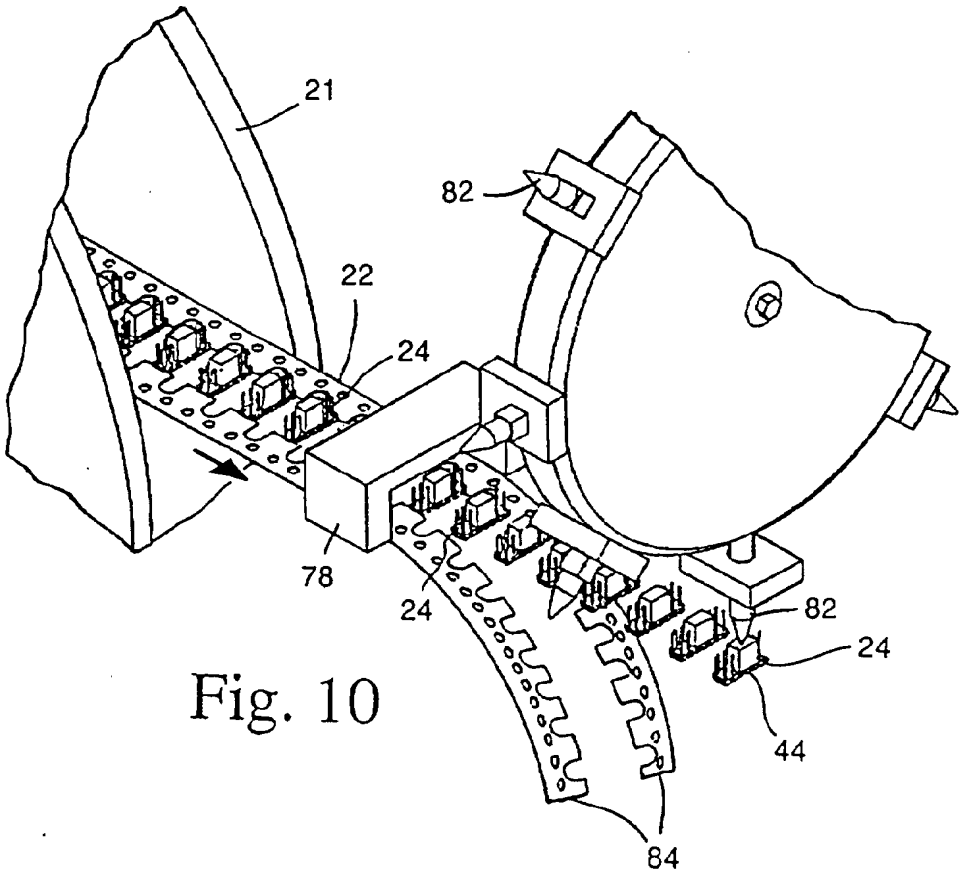

Fig. 10

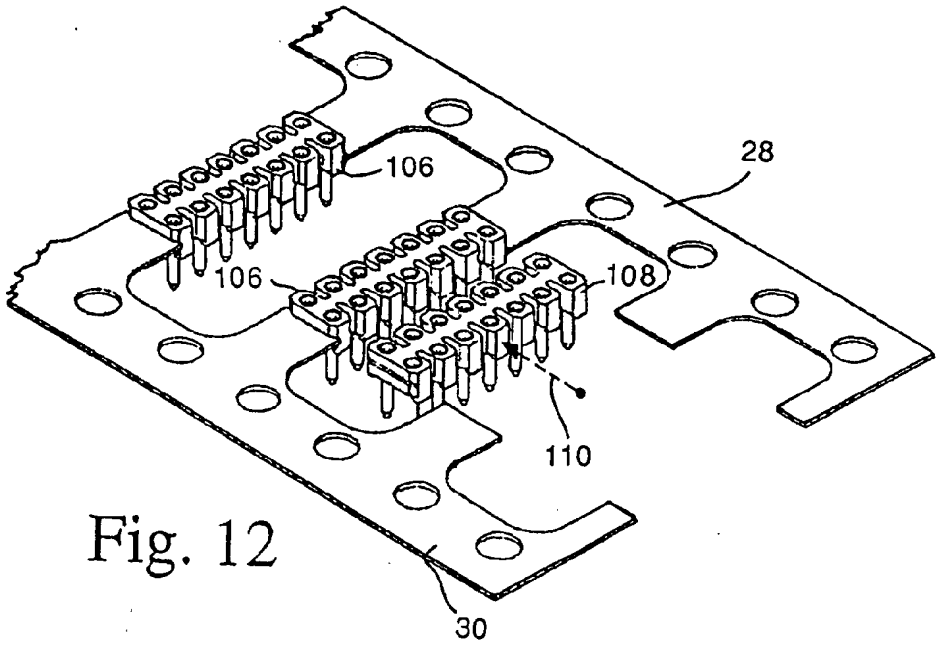

Fig. 12

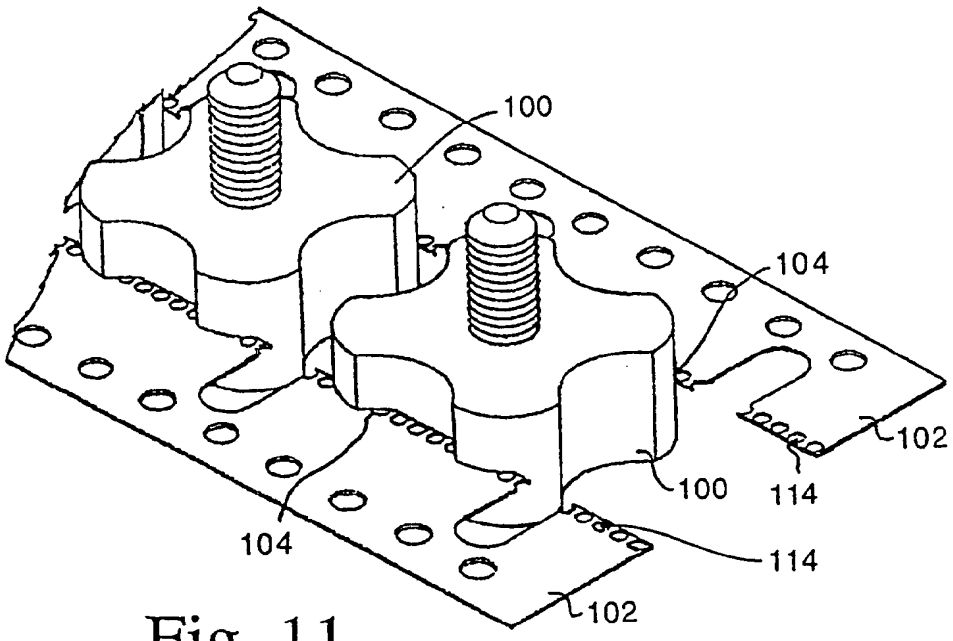

Fig. 11

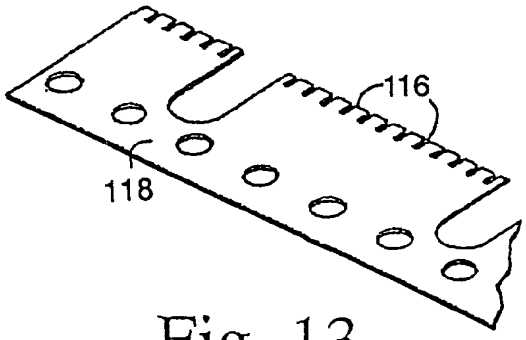

Fig. 13

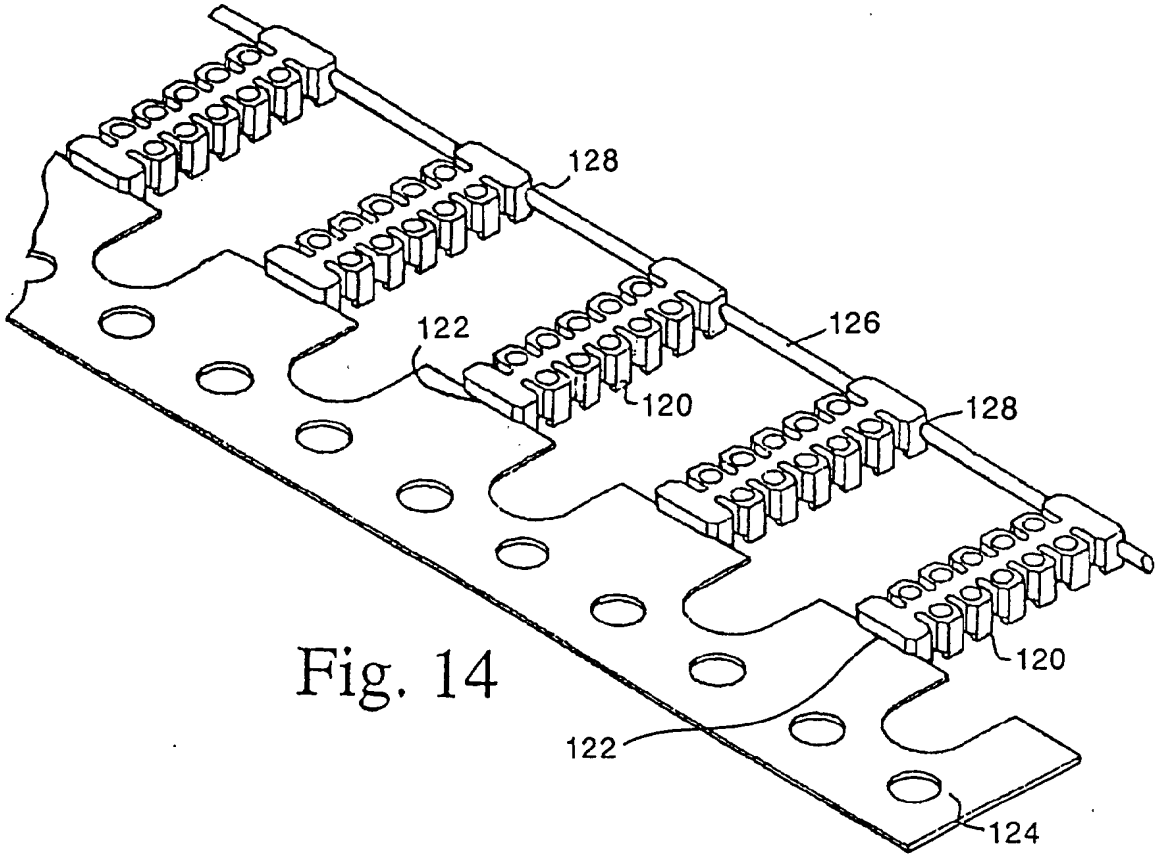

Fig. 14

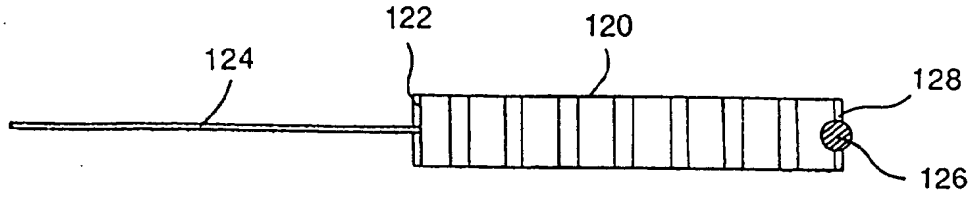

Fig. 15